FOREST RESEARCH DIGEST

JULY-AUGUST 1936

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LAKE STATES FOREST EXPERIMENT STATION*

FOREST SERVICE U. S. DEPT. AGR.

EFFECT OF DENSITY OF SOWING UPON WINTER HARDINESS OF JACK PINE

In the course of comprehensive planting experiments being carried out by the Station on the Huron National Forest, rather marked influence of density of sowing upon the survival of jack pine stock has been noted.

It has been rather common practice to treat jack pine much like Norway pine in the nursery. The result has been that jack pine, because of its greater growth and longer growing season, has as a rule produced rather top-heavy, spindly stock. The bulk of the stock has been grown at a density of 80 or more trees per square foot of seed bed. These trees average a top root ratio of 6 to 1 based upon both dry and green weight. The result of this spindly growth has been a susceptibility to freezing damage. On the basis of a careful examination of 9,000 trees, it was found that 39 percent of the 2-0 jack pine planted was killed by freezing over the first winter, and that freezing damage averaged about 80 percent of the total mortality. On the other hand, one lot of stock, due to unexpectedly low germination in the nursery, was grown at a density of about 45 trees per square foot of seed bed. This lot of stock, which was comparable in other respects including seed source with that already mentioned, showed a loss due to freezing of only 9 percent of the number of trees planted. This value is based upon a careful examination of more than 2,000 trees.

These figures seem to indicate quite clearly that jack pine should be grown less densely in the nursery in order to avoid heavy losses due to freezing.

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* Maintained in cooperation with the University of Minnesota at University Farm, St. Paul, Minnesota.

AN UNUSUAL PRUNING METHOD

During the course of the regional survey of older forest plantations now being conducted by the Station, a rather unusual method of pruning was observed in a plantation near Wingleton, Michigan. In this plantation the branches had been cut 1 to 2 inches from the bole on the theory that such a practice would produce more natural severance of the branches and avoid loose knots as a result of pitch pockets. This pruning had been done under the direction of a German forester.

Although it will take several years to determine whether or not the theory upon which this pruning is based is sound, the practice is of interest and may possibly lead to changes in the methods of pruning coniferous plantations.

An interesting comment on this method of pruning is found in a German article* on the pruning of birch limbs. It was found that dying birch limbs form a layer of tissue around the base of the limb which prevents fungi from entering the bole of the tree. If branches of any size are cut off close to the trunk, this layer does not form in time to stop the entrance of the fungi. Consequently, it is advocated that stubs about 1½ inches long should be left, when pruning larger branches. After 3-5 years, these stubs should be cut close to the stem.

SHELTERBELT EFFECTIVENESS

The Station has been conducting a series of intensive tests of the effectiveness of various types of wind barriers. A recent test shows that a sloping board fence, only half "solid" gives at least 50 percent more protection from wind to the ground on the leeward side than a vertical fence of the same height and density. Moreover, such a sloping fence is almost entirely free of eddy currents around its top. The standard design for shelterbelts, adopted when the project was initiated, was the sloping or hip-roof pattern.

THE DIRECTOR TO VISIT EUROPE

Mr. Raphael Zon will shortly depart for Europe in the official capacity of representative of the Forest Service to the International Union of Forest Research Organizations. The meetings of the Union will be held in Budapest, Hungary.

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* Schoningh, J., *Astung der Birke*, Forstachiv 11 (16) :261-267.

MANAGEMENT FOR MAXIMUM VOLUME OR HIGHEST QUALITY IN DENMARK

by H. L. Shirley

Denmark has probably the most intensive forestry of any European country and the individual forest supervisors have perhaps the greatest freedom to develop the type of silviculture they deem desirable, regardless of whether they are in private employ, or work for the city or state. As a result, widely diversified silvicultural practices may be found within the country. Two types will be described, that developed at Frisenborg and that developed at Soro.

At Frisenborg emphasis is placed on obtaining the maximum possible yield in cubic volume from a given area of land, and to do this with as little growing stock as possible. Natural reproduction is not wanted and a good seed year considered a curse to forest management.

The forests are started by planting, which the foresters prefer to natural reproduction, since they know how to plant successfully and know how to manage a planted stand. Thinnings are started relatively early, but not before merchantable products can be removed. From then on, thinnings are made frequently and are relatively heavy so that by the time the stand has reached pole size the live crowns on the crop trees include from 1/2 - 2/3 the total height. This type of management allows a maximum yield from thinnings. For those who wish to consider percentage yield as a measure of income on investment this system gives the highest returns. It might, therefore, appeal particularly to the private owner. From the national standpoint it has certain disadvantages. It gives a high yield in cubic contents but much of it is in small sizes or inferior quality material. It provides practically no reserve for a period when overcutting is nationally desirable such as during war or depression.

An entirely different type of silviculture is practiced by Mundt at Soro. Here the primary emphasis is placed on the quality of the product rather than on maximum yield in volume. This type of silviculture resembles the "Dauerwald" in Germany in producing stands natural in appearance but is even more intensive in practice. The young trees are brought up under the shade of old ones until the selected crop trees have

attained a clear length of about twenty to thirty feet or more. Then by gradually removing the old trees and thinning the smaller ones which crowd the crop trees, these are allowed to develop a large, full crown almost spherical in shape, which is maintained until time for harvest. Thinning often occurs at 2 - 3 year intervals, especially at the beginning when selected trees are being changed from small, whip-like saplings to full-crowned, full-boled crop trees. When carried out in its ideal form this method produces a stem the cross-section of which shows many very narrow growth rings in the center. As much as 50 years may be spent in developing the clean-stemmed sapling suitable for a crop tree. From this point on the annual rings become gradually broader and broader until the time for final harvest. When properly cared for, a 4-inch sapling at 50 years may develop into a 20-inch timber tree at 80-90 years.

The yield in cubic volume by this method is not so high as in the system described above, but the final crop trees produce a maximum amount of absolutely clear lumber. The time required to develop the sapling may be long, but during this period the soil is being occupied chiefly by other crop trees. As virgin timber becomes more and more exhausted it appears evident that there will be an ever enlarging demand for this type of silviculture to produce the clear lumber required by industry. Even more than the German "Dauerwald", this system requires a highly trained and very skillful man for its successful administration. It also requires a market for very small sized material as well as for very high quality material.

DRY SEEDS CAN STAND HIGHER TEMPERATURES

The extraction of the seed of conifers in artificially heated kilns requires considerable care in order to secure a large yield of seed without injuring it by the temperatures used.

A recent study carried out at the Pacific Northwest Forest Experiment Station* shows that, in the case of Douglas fir and ponderosa pine, seeds with a low moisture content are more resistant to the injurous effects of high kiln temperatures

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* *Viability of Conifer Seed as Affected by Seed Moisture Content and Kiln Temperature* by William G. Norris. Journal of Agricultural Research, Vol. 52, No. 11, June 1, 1936.

than are seeds of high moisture content. Actual values of the critical points of temperature and moisture-content are given for the two species studied but these would not be applicable to Lake States species unless they were checked.

However, several useful generalizations for kiln operation can be derived from the results of the experiment. First, there should be a good circulation of air around every cone in order that the seeds may dry more rapidly and thus be better able to resist heat injury. In terms of actual practice this means that cones should not be piled thickly in the trays. Second, a relatively low temperature should be used at the beginning of the run and this may be increased as the cones dry. If the cones have already been somewhat air-dried before they are put in the kiln, they may be started at a higher temperature than green cones.

THE IMPORTANCE OF SMALL STREAMS

A very readable bulletin on soil erosion and water conservation has recently been prepared cooperatively by the Soil Conservation Service, the Resettlement Administration and the Rural Electrification Administration. The bulletin is entitled "Little Waters - Their Use and Relations to the Land", and as the title indicates the major emphasis is placed upon demonstrating the importance of the protection and conservation of small watersheds. Vast flood control projects on the large rivers can do much to prevent flood damage. But the bulletin dramatizes the role of the "little waters" in the prevention of excessive run-off and soil loss. Only by careful regulation of such waters can much of the present and future damage be eliminated.

The balance of the factors which control our water resources from their beginning as precipitation to their return to the air as vapor is delicate and easily upset. "Little waters" are the foundation of the water cycle and every effort must be made to maintain them in their proper condition.

The social significance of the program of water and soil conservation is also discussed in the bulletin. It is clearly evident that here is no program of "made-work" for a period of economic depression but a vital, national necessity which must be met by concerted attack carried forward by the impetus of an aroused, non-partisan, public sentiment.

THE SHINGLE INDUSTRY OF THE UPPER PENINSULA

For a decade or more the white cedar shingle industry of the Northern Lake States has been in a serious condition. Competition from substitutes and western shingles, a badly diminished supply of accessible high grade cedar, the decline in agricultural buying power, and the general business depression had brought about an almost complete collapse in the local shingle industry.

With the advent of better business conditions and an improved agricultural situation, the shingle industry is once more taking on new life. Roof repairs, neglected for many years, are now receiving attention both in the cities and on the farms. Wooden roofs seem to be returning to favor. New building has given an additional spurt to the industry. Many of the medium sized homes are now using shingle covering in place of stucco or regular wood siding. Many summer homes, service stations, etc., now under construction are using shingle siding. Truck logging and relative proximity to markets has enabled the Lake States mills to compete on somewhat more favorable terms with the western producers, although western shingles still dominate the market.

In the summer of 1935 the Forest Survey found that there were about 20 shingle mills in the Upper Peninsula of Michigan. These had a total annual production of about 40,000 M. shingles or 160,000 bundles. A total of 180 men were employed in the mills and an equal number in the woods. About 12,800 cords of cedar were consumed in the production of these shingles, divided into the following components of standing timber: - pole material, 17.1 percent; post material, 5.2 percent; hollow butts, 34.4 percent; cull or dead trees, 43.3 percent.

From an economic viewpoint the shingle business has several interesting and rather far-reaching effects. Instead of being integrated with other units of the forest industries, shingle mills are more often set up independently near the source of supply. The industry is thus decentralized and made a part of the smaller communities. Inasmuch as a minimum amount of capital is needed and equipment can often be obtained second hand from former operations, a shingle mill is ideal as a small industrial enterprise for small forest communities. The cost of raw materials is little or nothing since cull and dead trees are used.

As an example of what an industry of this kind means to a small community, the situation at Calderwood, Michigan, stands out. Calderwood is a former sawmill town which has been in bad financial condition since the mill closed in 1926. The people who did not move after the sawmill closed were stranded without any adequate means of support. A majority were dependent upon relief even before the low ebb of the business cycle. In 1934 some outsiders from a near-by community fitted up a small shingle mill on the river bank to utilize cedar bolts floated to the mill. For two years employment has been provided for a number of the local people and the relief situation has been notably improved. The development has been repeated to a lesser extent in a dozen or more other places in northern Michigan.

There are two significant facts which may be drawn from the experience of the cedar shingle industry. In the first place, it shows that there are opportunities for part time employment and cash income even on the cut-over and seriously depleted forest lands in the Lake States if enterprising individuals find the right combination of wood, machinery, and labor. High class raw material is not essential. In the second place, it indicates that to be profitable the new industries must be decentralized, set up on not too large a scale and close to the source of raw materials. In both these respects the shingle industry offers an encouraging suggestion for the smaller communities of the Northern Lake States.

GRASS SOWN IN BAGS CHECKS GULLY EROSION

An effective method of checking small gully erosion with vegetation has been developed by the Southwestern Forest and Range Experiment Station.*

The method consists in filling gunny sacks with earth and then mixing in some grass seed next to one side of the sack. These sacks are then set in place across gullies, with the seeded side uppermost; sometimes three sacks are used to form a dam, while in small gullies only one is needed.

It was found that the grass seedlings made their appearance soon after the beginning of the summer rains. At the end of the second summer the grasses had established themselves

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* *Revegetation of Small Gullies Through the Use of Seeded Earth Filled Sacks.* by B. A. Hendricks, Range Influences Note No. 1, June 1, 1936.

firmly and the sacks had begun to go to pieces.

The soil used in the sacks was good topsoil, and this enabled the grasses to get off to a good start.

YEAST FROM WASTE PULP LIQUOR

A plant in Nova Scotia is now producing yeast grown on the waste liquor of sulfite pulp mills. This liquor contains sufficient sugar to permit the commercial production of yeast, and the liquor has now almost entirely supplanted molasses which was formerly used. The liquor from one ton of sulfite pulp is the basis for the production of 350 to 450 pounds of yeast.

CONSERVATION EDUCATION IN MINNESOTA

Approximately 50 members of the Minnesota Academy of Science attended the annual summer meeting which was in the form of a symposium on Conservation Education held Friday, July 24 at the State Teachers College at Bemidji, Minnesota. A brisk discussion was held after several enlightening talks on this subject, but the question, "Should Minnesota schools have compulsory conservation education?" remained unanswered.

The following Saturday and Sunday, members of the Academy were guests of the Forest ~~Survey~~ Service at Cass Lake. Under the guidance of Dr. Shirley several tours were conducted through the Lydick Nursery, the Chippewa National Forest, and the Pike Bay Experimental Forest. The newly completed Forest Service office and laboratory building was the headquarters of the Academy in Cass Lake and its rustic beauty was greatly appreciated by the visitors.

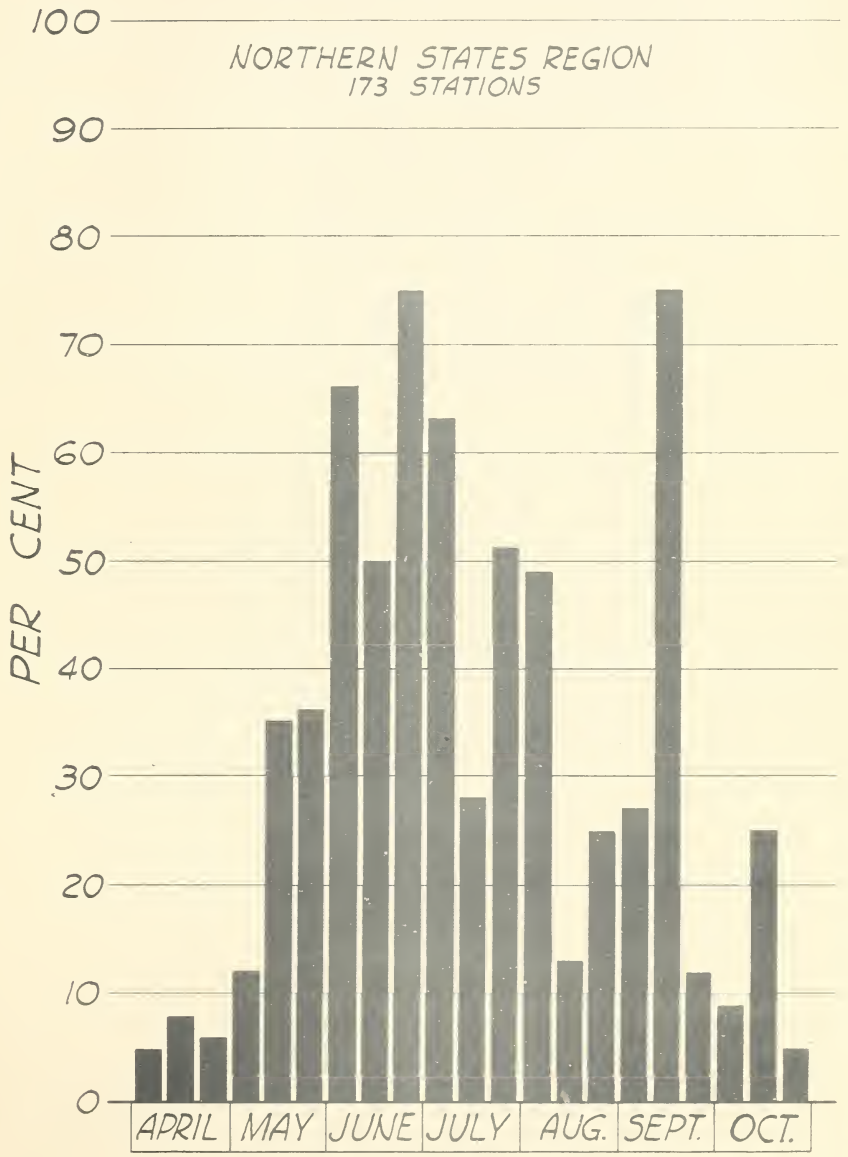
DISTRIBUTION OF RAINFALL DURING THE FIRE SEASON

The occurrence, amount and distribution of precipitation are among the most important factors determining the extent and severity of the forest fire season. While past experience is no guarantee of future performance, an analysis of available records at least indicates what may reasonably be expected and to that extent is useful in long-time planning.

For example, the fire season in the northern Lake States region, which extends from the time snow leaves the ground in the spring until it returns in the fall, is characterized

CHART 1

PER CENT OF STATIONS WITH 70% PROBABILITY OF 0.5 INCHES OF RAIN IN 10 DAYS



(1) by relatively low precipitation in the spring and fall; (2) by general rains in June and mid-September; and (3) by intermittant local showers during the summer with a period of more or less general drought in August.

While, owing to local and seasonal variations, generalized conclusions cannot be applied specifically, they serve a useful purpose in pointing out characteristic seasonal differences between various parts of the region. Chart 1, for example, gives a picture of the general seasonal distribution of effective rains for the region as a whole; while Chart 2 shows how the three states differ in this respect. From the latter it will be seen that while all three states are deficient in precipitation in early spring and late fall, Wisconsin and Minnesota are more likely to have effective late spring and early summer rains, while Michigan and Wisconsin are more likely to have effective rains in mid-September. Michigan, it will also be noted, is likely to have effective rains in mid-October which accounts for the normally low fire hazard in that state in the fall.

A further breaking down of the data by groups of stations (Charts 3, 4 and 5) shows a similar though less marked difference in the probable occurrence of effective precipitation between various parts of each state. Thus the seasonal distribution of precipitation in northeast Minnesota and in upper Michigan differs materially from that in the balance of the states in question. Other characteristic differences between various sub-regions are also apparent though not so outstanding.

A still more detailed analysis of the characteristic distribution of precipitation is given in a series of maps recently prepared and available on request showing the probability of 0.5 inches or more of rain throughout the region for each ten days of the normal fire season. The above, however, serves to bring out the chief differences between the major subdivisions designated.

It is realized that the figures on which the above conclusions are based are not entirely satisfactory, since the stations involved are not uniformily distributed and are not identical as to period and length of record. The data used, however, is the best available and the conclusions reached are at least indicative of conditions, since the stations involved are widely if not uniformally distributed and the period covered (26 years on the average) is sufficiently long to give a reasonably good average of conditions.

CHART 2

PER CENT OF STATIONS WITH 70% PROBABILITY OF 0.5 INCHES OF RAIN IN 10 DAYS

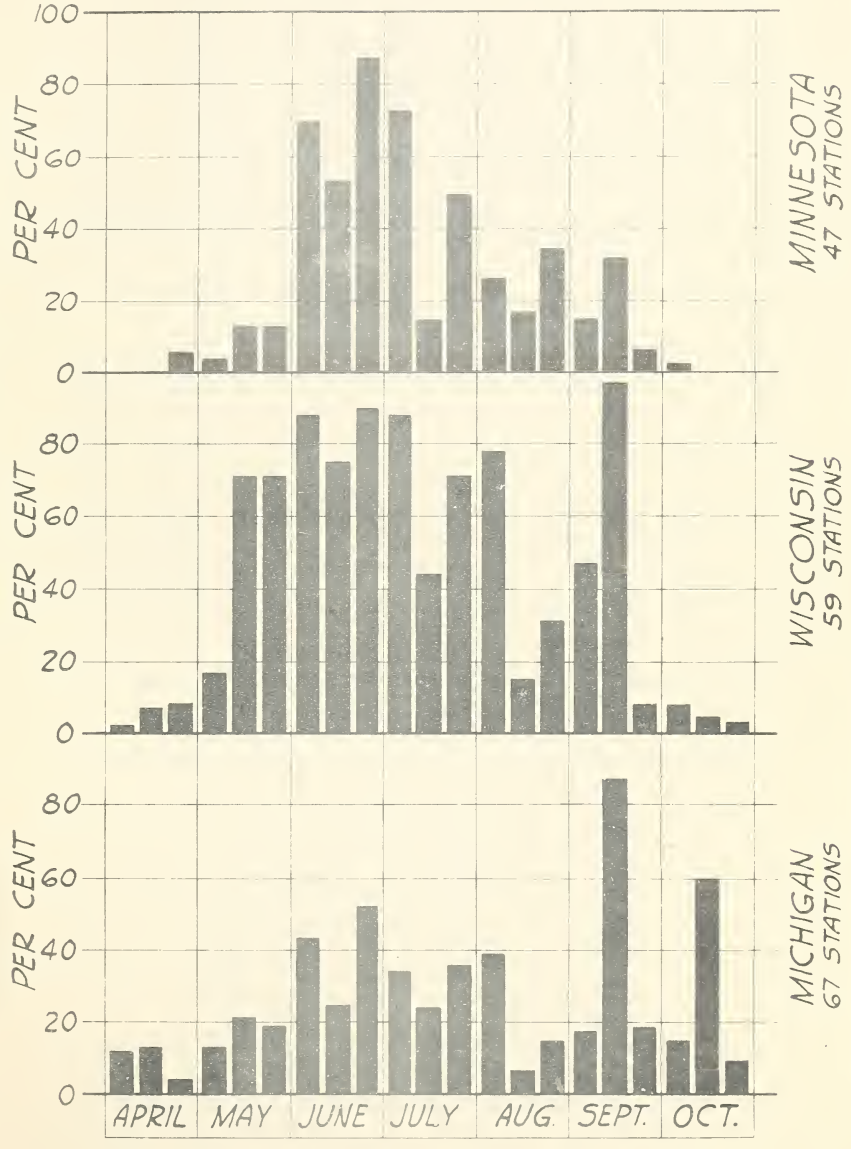
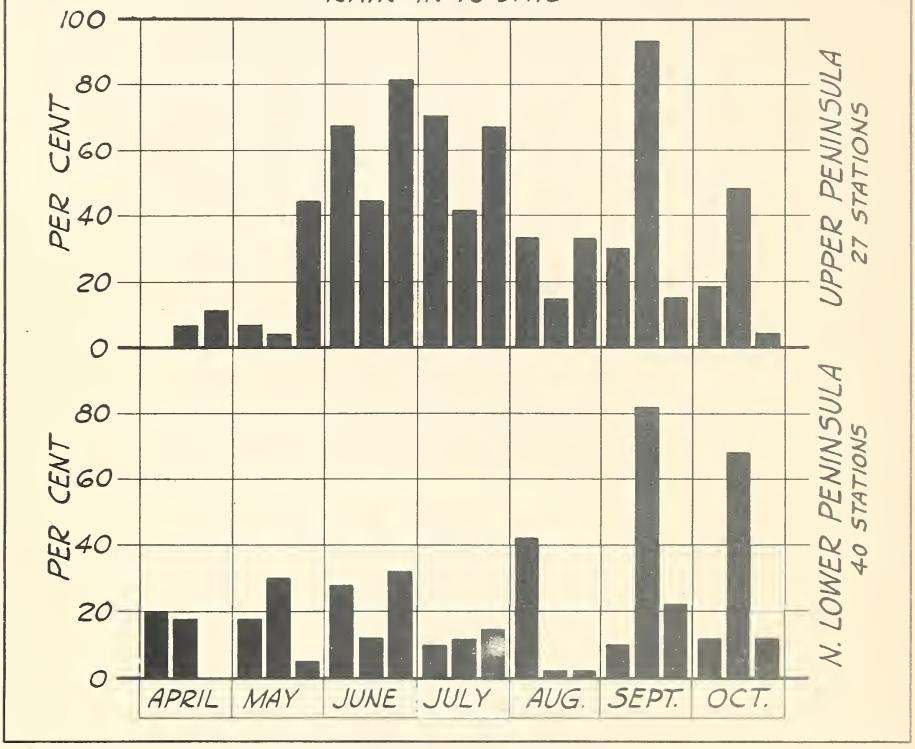
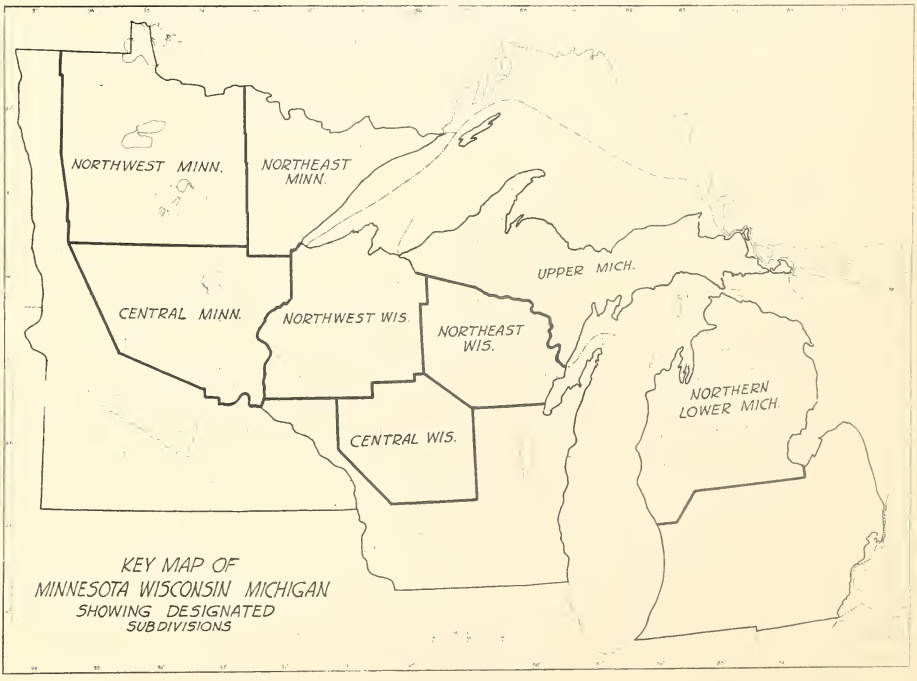


CHART 3

MICHIGAN

PER CENT OF STATIONS WITH 70% PROBABILITY OF 0.5 INCHES OF RAIN IN 10 DAYS





KEY MAP OF MINNESOTA WISCONSIN MICHIGAN SHOWING DESIGNATED SUBDIVISIONS

CHART 4

WISCONSIN

PER CENT OF STATIONS WITH 70% PROBABILITY OF 0.5 INCHES OF RAIN IN 10 DAYS

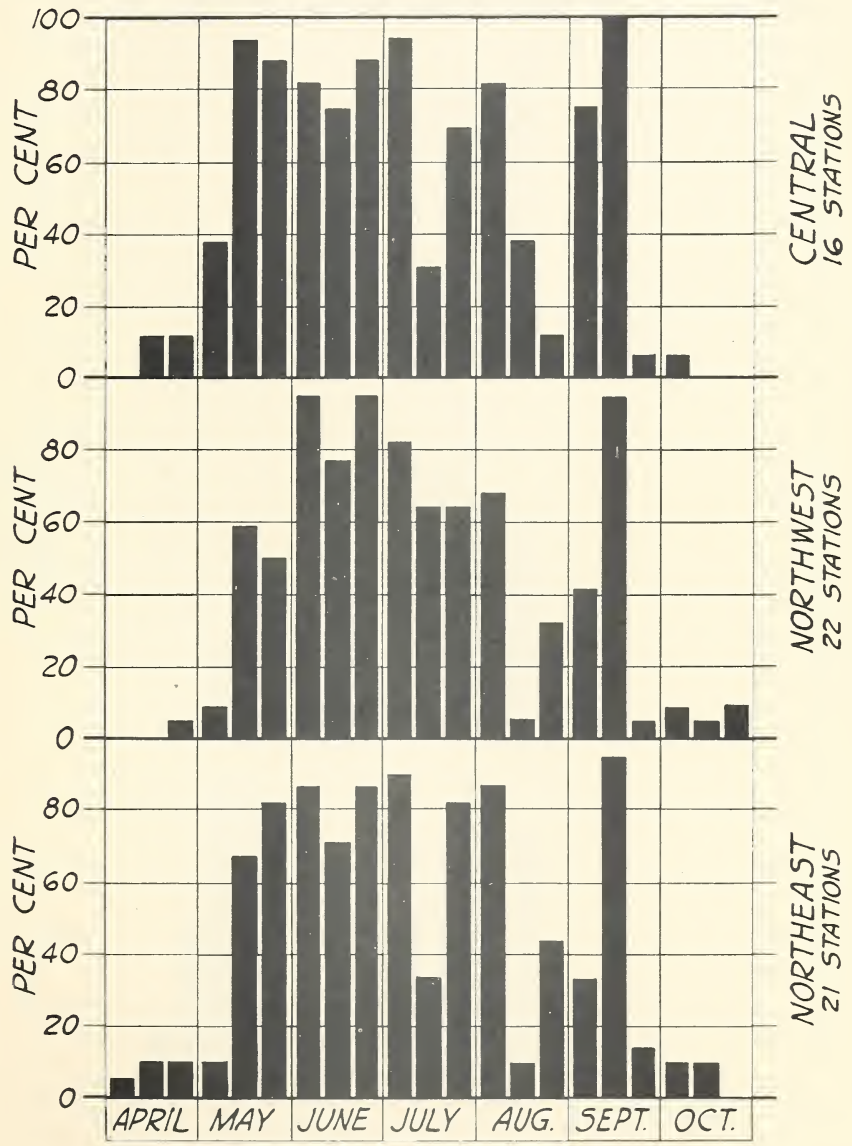


CHART 5

MINNESOTA

PER CENT OF STATIONS WITH 70% PROBABILITY OF 0.5 INCHES OF RAIN IN 10 DAYS